



MINERGIE – The Swiss Green Building Standard

MINERGIE – 瑞士绿色建筑标准

中瑞零碳建筑系列研讨会

ZEB Talk

由intep/Skat联合CABR共同举办

organised by
INTEP/SKAT/CABR

20th Dec. 2022

Minergie Association (Switzerland)

Minergie 协会 (瑞士)



- Andreas Meyer Primavesi
 - CEO
 - Minergie Association (Switzerland)
- Minergie 协会 (瑞士)

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Minergie Association
Minergie 协会



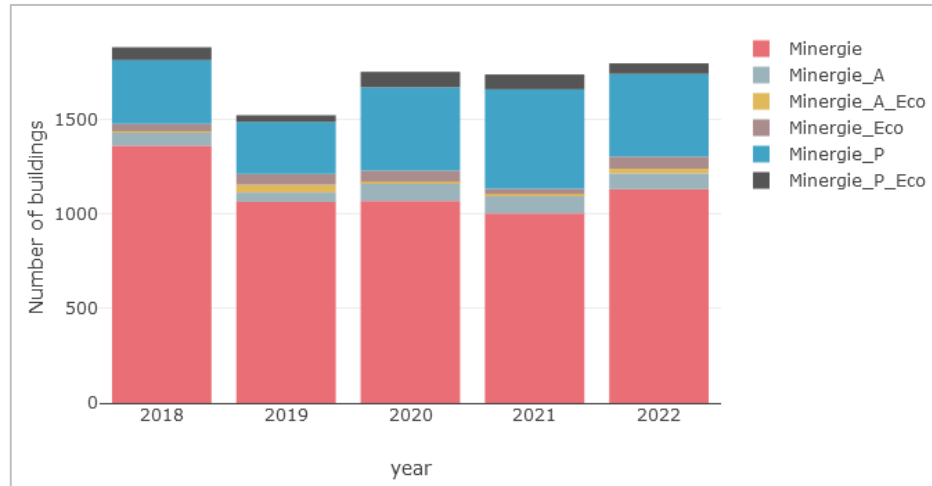
Our beginnings (BE-007, 1998) → The energy balance of these buildings is enough for a Swiss building permit until today
始于(BE-0071998) → 这些建筑的能量平衡足以获得如今的瑞士建筑许可证

About MINERGIE:

- 1 Vision, similar to Passive House but more liberal
- 24 Years of experience
- 55'000 certified Buildings (62 million m²)
- 1'200'000 daily Users in Switzerland (15% of population)
- 67 GWh energy and 11.9 Mio. t CO_{2eq} saved over 24 years
- Next step: Net zero emissions including embodied CO₂

关于 MINERGIE:

- 1个愿景，类似于被动房，但更自由
- 24年实践经验
- 55'000 获得认证的建筑 (6200 万m²)
- 1'200'000 在瑞士的日用户(总人口的15%)
- 24年来共节约了67 GWh 的能源，减排 1190万吨CO₂
- 下一步：净零排放，包括建筑隐含碳排放



Minergie is the dominant label in the Swiss market. Steady growth despite tighter standards and stagnating of new construction in Swiss building sector

Minergie是瑞士市场的主导品牌。尽管瑞士建筑行业标准更严格，新建建筑项目较少，但Minergie仍保持稳定增长

Market share:

- Swiss market share of around 20% of all new buildings, in refurbishment much lower
- All building categories and sizes
- Other important labels in Switzerland are GEAK (official Swiss building energy certificate), SNBS, LEED and DGNB.

市场份额:

- 瑞士，获得Minergie认证的建筑面积份额约占所有新建建筑的20%，翻新建筑要低很多
- 适用于所有建筑类别和不同的建筑规模
- 瑞士其他重要的认证标签还包括GEAK（瑞士官方建筑能源证书）、SNBS、LEED和DGNB.

Minergie is slowly but surely becoming international Minergie正在推进其国际化，虽然缓慢，但方向是确定的。

(in red: new countries 2022) (红色标注：2022年新扩张的国家)



Land 国家	Anzahl Gebäude 认证建筑数	Energiebezugsfläche (m²) 能源相关面积
Frankreich 法国	256	175'726
Deutschland 德国	9	3'890
Italien 意大利	12	6'418
Luxemburg 卢森堡	3	5'988
Österreich 奥地利	2	727
Spanien 西班牙	2	2'985
Vereinigte Arabische Emirate 阿联酋	2	34'211
Polen 波兰	1	4'890
USA 美国	1	303
Chile 智利	10	
Mexico 墨西哥	2	
China 中国	0 (several requests ongoing)	(进行中)

Minergie Standards, with focus on Minergie-A

Minergie 标准, 重点介绍Minergie-A



IKEA certifies the buildings in Switzerland
according to Minergie
瑞士宜家的若干建筑获得了Minergie认证

Principles of Minergie standards:

- Key success factor has always been the strive for simplicity.
- The core values are comfort, climate protection (zero carbon) and energy efficiency.
- Strict targets, but no specification of the technical solution
- Historically communicating comfort “over” efficiency has led to the huge success.

Minergie标准的原则:

- 成功的关键因素始终是力求简单
- 核心价值观是舒适、气候保护（零碳）和能源效率
- 严格的目标，但没有对技术解决方案提出具体要求
- 从历史上讲，舒适“先于”效率的方式带来了巨大的成功

Our products 产品介绍

Minergie 48'000 certified buildings

Efficiency and Quality

Minergie 48000栋建筑得到认证

效率及质量



Minergie-P 6'000 certified buildings

Swiss Passiv House Standard

Minergie-P级 6000栋建筑得到认证

瑞士被动式房屋标准



Minergie-A 1'000 certified buildings

Top-Standard, Production higher Consumption

Minergie-A级 1000栋建筑得到认证

顶级标准，生产能源大于能源消耗



ECO The addition for health and ecology

Minergie-ECO级 健康和生态相关的补充认证



MQS
Bau

Quality
Control in
Construction
Minergie质量
标准 - 建造

建设中控制质量



MQS
Betrieb

Quality
Control in
Operation
Minergie质量
标准 - 运营

运营中控制质量



Minergie knows three levels:

- **Minergie** corresponds to the "Nearly Zero Energy Building NZEB",
- **Minergie-P** to the Swiss Passive House,
- **Minergie-A** to a building that produces more energy than it needs

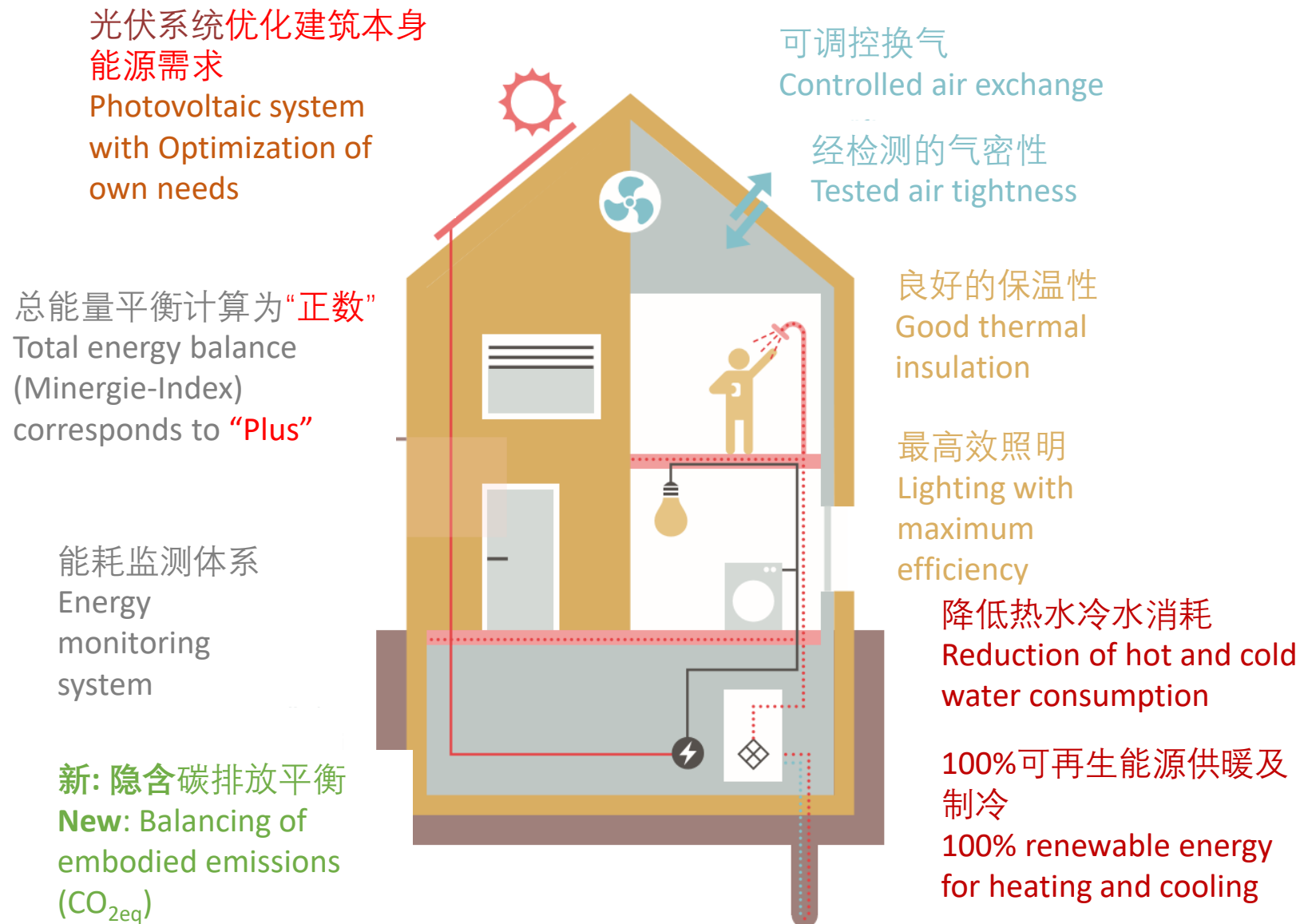
The **ECO** suffix stands for health and building ecology. In addition, there are two quality assurance methods for construction phase and operation (**MQS**)

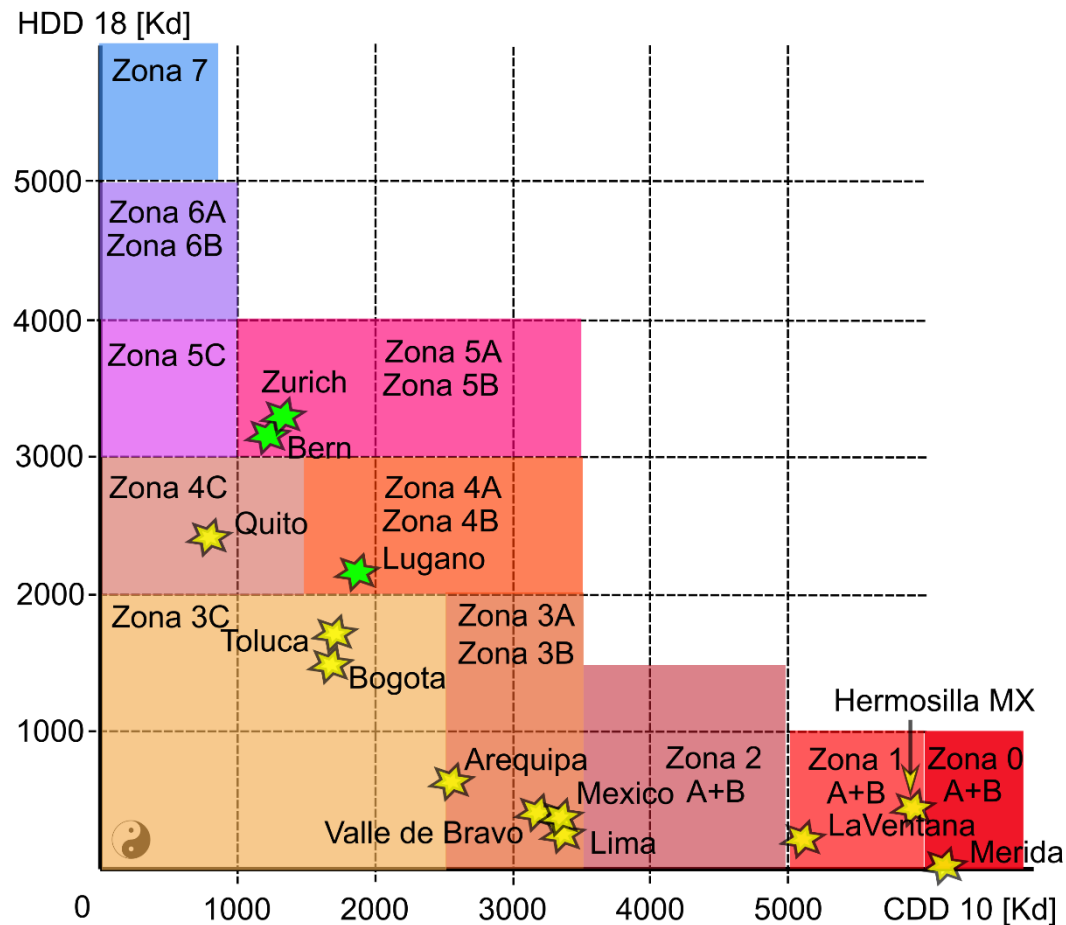
Minergie三个级别：

- Minergie对应于“近零能耗建筑NZEB”
- Minergie-P对应于瑞士被动式建筑
- Minergie-A是指生产比所需更多能源的建筑

ECO后缀代表健康和建筑生态
此外，分别针对施工阶段和运营（MQS）阶段开发了两种质量保证方法

Minergie-A on one page 一页纸介绍Minergie-A





Climate zones

- The Minergie standard works in all climate zones (hot-dry, hot-humid, dry-cool, humid-cool, etc.).
- We are currently developing the standards for Latin America based on the ASHRAE climate zones.
- Graphics: Professor Armin Binz; HDD = Heating Degree Days, CDD = Cooling Degree Days.

气候区

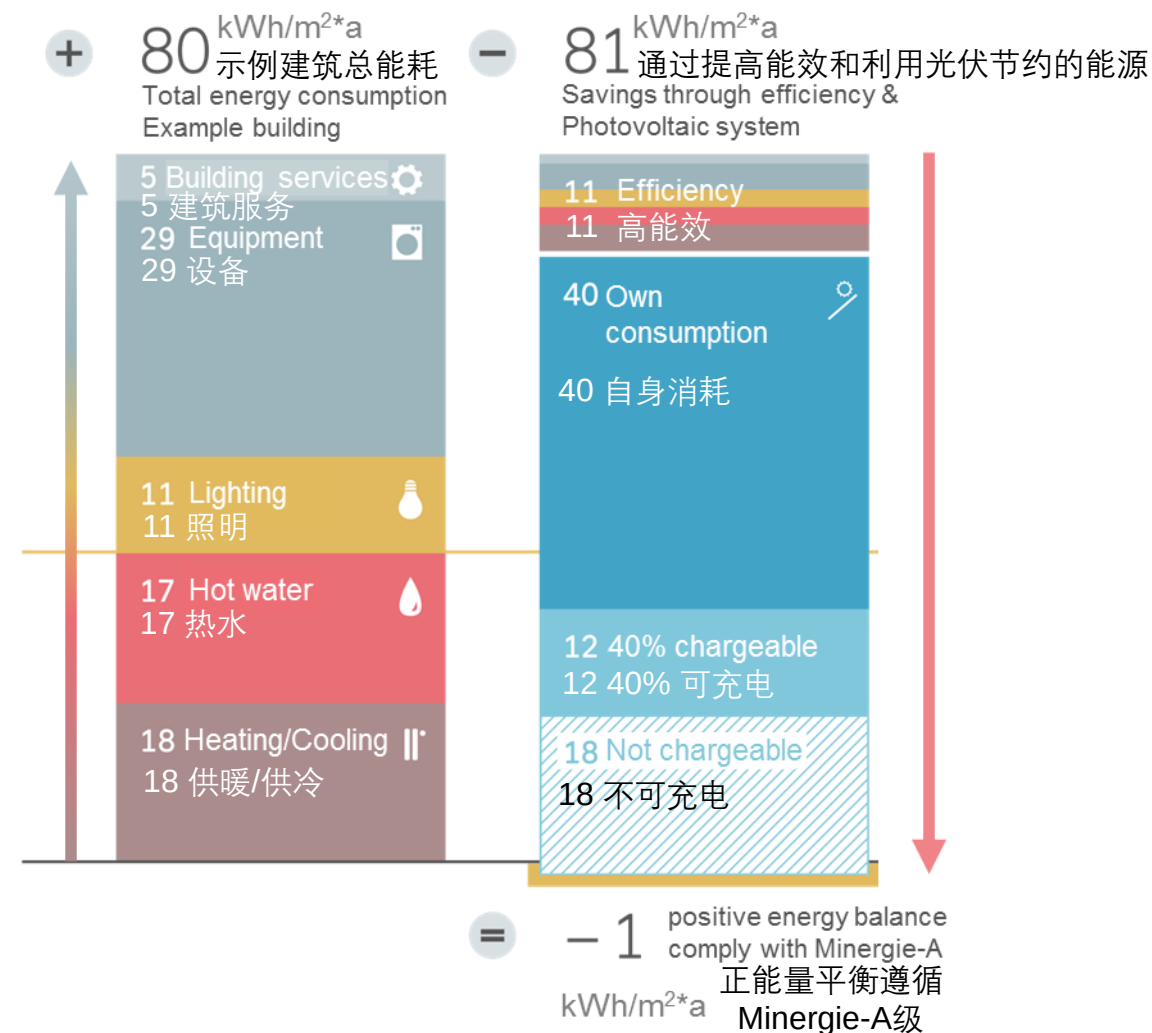
- Minergie标准适用于所有气候区域（干热、湿热、干冷、湿冷等）
- 目前正在基于ASHRAE气候区为拉丁美洲制定相应的标准
- 图形：Armin Binz教授；HDD=供暖度*天数，CDD=制冷度*天数

The Minergie-A index

- Minergie specifies minimum requirements for the indoor climate. Heating, cooling and dehumidification are permitted.
- However, the energy required for these activities must all be included in the Minergie-A index - without fossil fuels!
- Without a good building envelope, including airtightness, good sun protection and sufficient insulation, the limit values cannot be met.

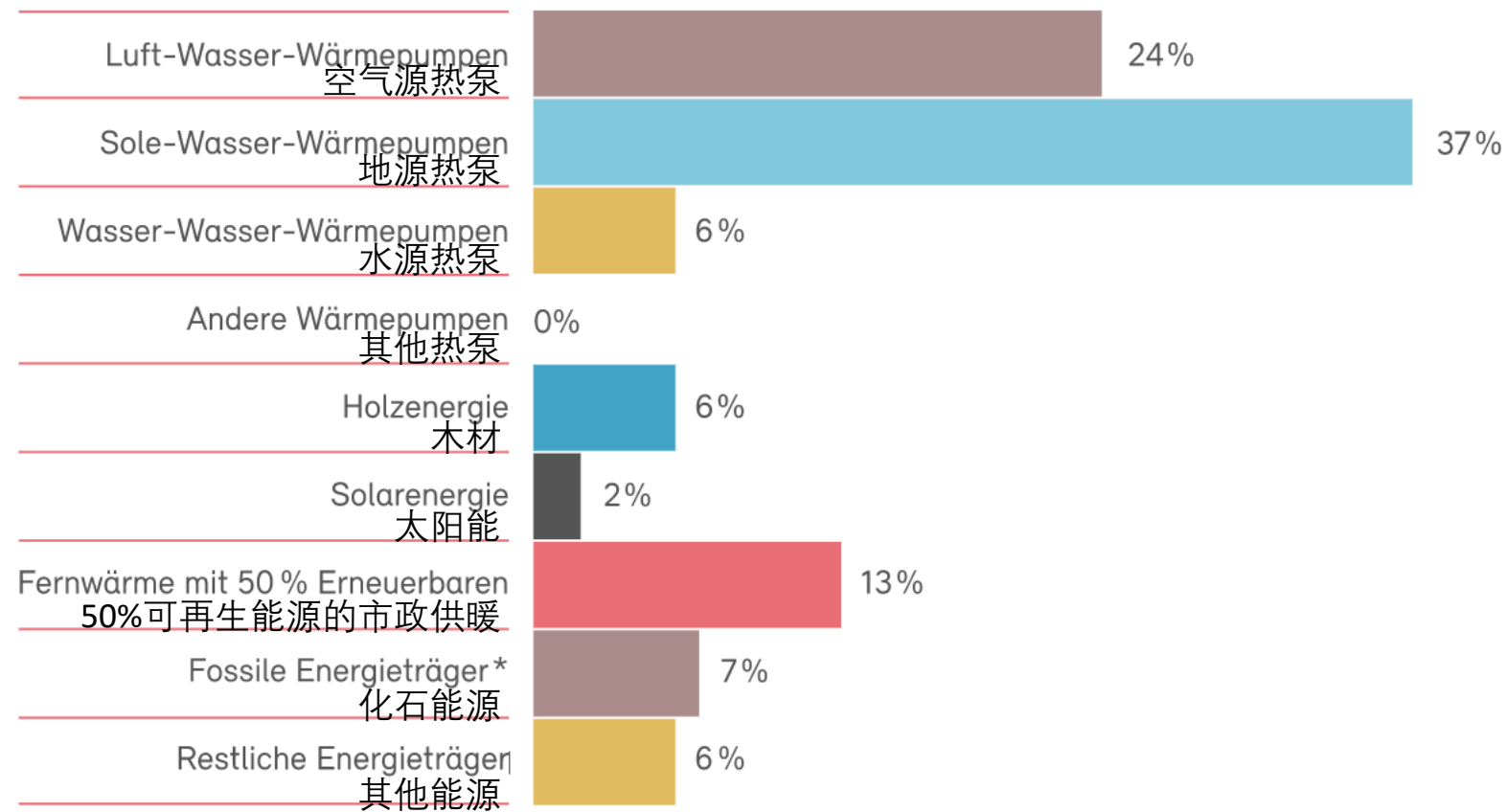
Minergie-A指标

- Minergie对室内气候的若干指标设定了最低要求，并允许加热、冷却和除湿。
- 然而，这些活动所需的能量必须全部包含在Minergie-A指标中，且不含化石燃料！
- 如果没有良好的建筑围护结构，包括绝佳的气密性、良好遮阳晒和充分的隔热，就无法满足该限定值。



Energy sources in new Minergie buildings, 2014-2021 (* fossil fuels now banned)

2014-2021年Minergie认证的新建建筑能量来源 (*化石燃料现已被禁止)



*inzwischen verboten



SPOTLIGHT on: Summer thermal protection

- Minergie projects must meet high requirements for summer thermal insulation: The indoor temperature may rise above 26.5°C for a maximum of 100 hours per year under standard conditions
- The basis for compliance with these comfort requirements is provided by structural measures (proportion of windows, fixed shading, movable sun blinds, insulation of the building envelope, possibility of night cooling, etc.). Cooling is permissible, but must be included in the energy balance
- If possible, simulate with climate data for 2035-2060, including heat island effect in cities.

亮点：夏季热防护

- Minergie项目必须满足夏季隔热的高要求：在标准条件下，室内温度超过26.5°C的时间不超过100小时/年
- 结构措施是实现这些舒适性要求基础（窗户比例、固定遮阳帘、活动遮阳帘、建筑围护结构隔热、夜间降温可能性等）。制冷是允许的，但必须包括在能量平衡计算中
- 如果可能，请使用2035-2060年的气候数据进行模拟，包括城市中的热岛效应



Good summer thermal protection is fundamental in the face of rapidly advancing climate change.

面对快速发展的气候变化，良好的夏季热保护至关重要。



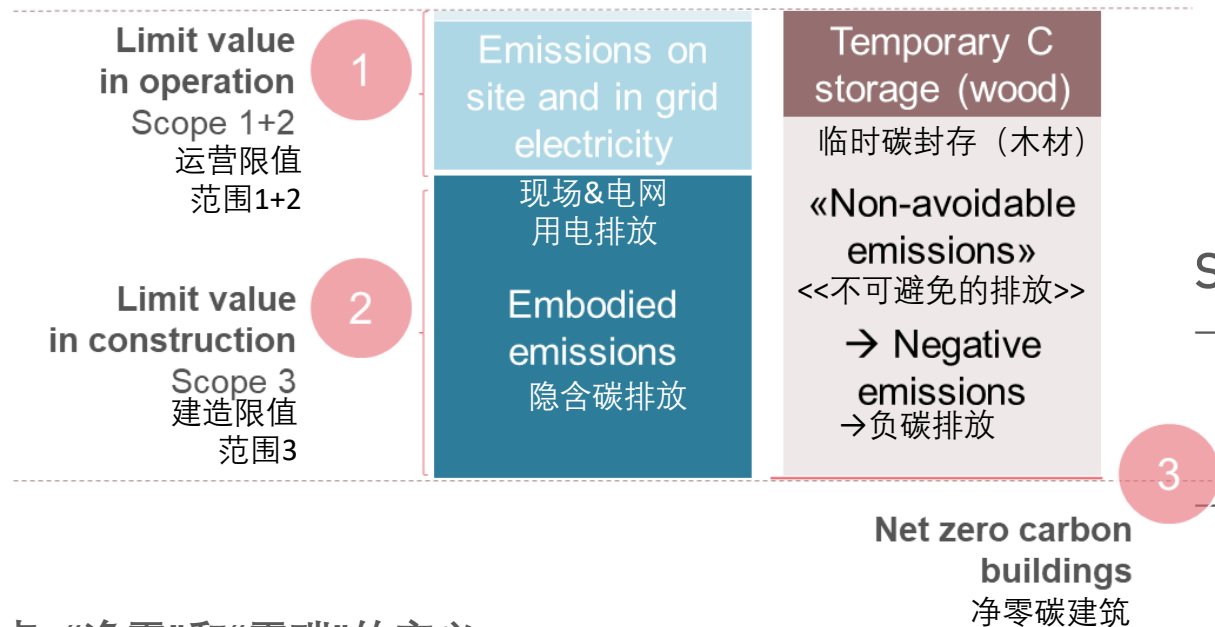
Highest Minergie-Building in Zurich (ZH-5000)
位于苏黎世经Minergie认证的最高建筑 (ZH-5000)

SPOTLIGHT on: Embodied emissions

- Progress towards greater efficiency and renewable energies in operations is now rapidly becoming apparent in Switzerland
- The issue of emissions from building materials remains unresolved. In itself, the issue should be addressed with the polluter, the manufacturers of the building materials.
- In addition, however, building owners should be motivated to use building materials efficiently.
- Buildings with a lot of concrete, steel and glass are coming under pressure.

亮点：隐含碳排放

- 瑞士正在加速推进提高建筑运营效率和可再生能源利用
- 建筑材料排放问题仍未解决。单就其本身而言，这个问题应该由污染者、建筑材料制造商来解决
- 然而，建筑业主应积极有效地使用建筑材料
- 使用大量混凝土、钢和玻璃的建筑正在承受压力



SPOTLIGHT on: Definition of "net zero" and "zero carbon"

- In Switzerland, a distinction is made between "net zero emissions" in operation, and this balance for "operation and construction" together.
- Every Minergie-Building is zero carbon with the scope1 approach (fossil fuels forbidden). With the scope2 approach (consideration of CO2 emissions from electricity production) not yet.
- Already known and practicable is the approach to "compensate" the operational emissions by own electricity production. Compensation including embodied emissions is currently still unrealistic in the Swiss climate types.
- According to IPCC, emissions must be compensated with "negative emissions", but this is still rarely the case in Switzerland

亮点: “净零”和“零碳”的定义

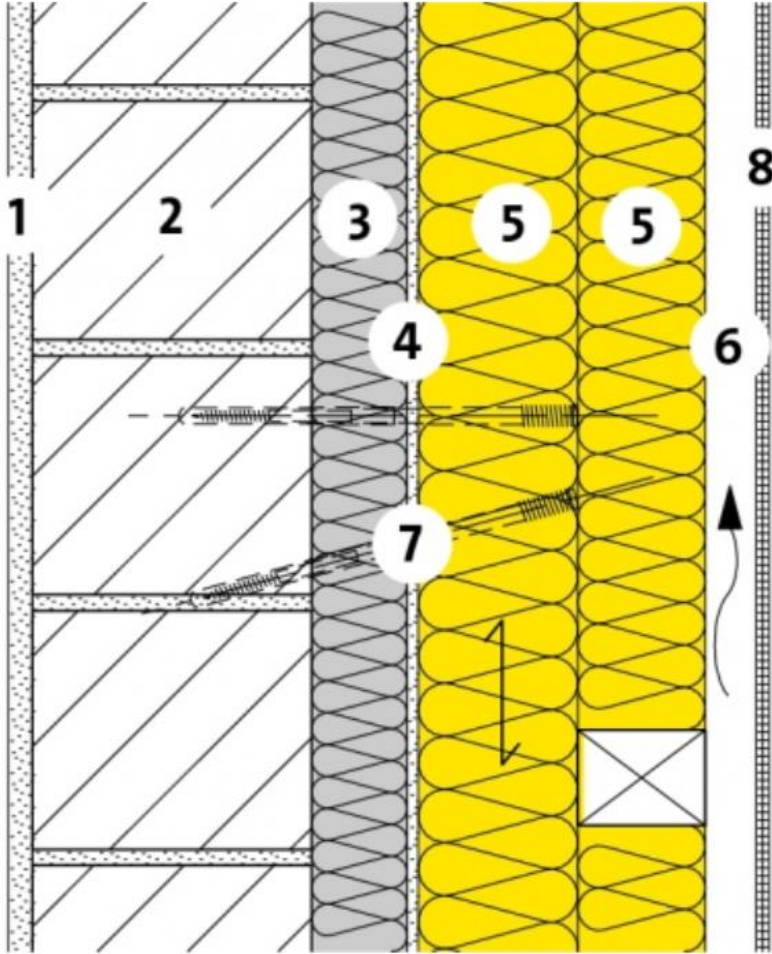
- 在瑞士, 对“运营阶段”和“运营和建设阶段”的“净零排放”进行了区分
- 每一个Minergie项目在范围1内都实现了零碳排放 (通过禁止使用化石燃料)。在范围2的框架内 (考虑发电产生的CO2排放) 还未实现
- 通过自发电力来“平衡”运营阶段的碳排放已经为人所知且可行, 同时平衡隐含碳排放目前在瑞士气候条件下仍然不切实际。
- 根据IPCC, 碳排放必须用“负碳排放”来平衡掉。然而在瑞士, 这样的情况仍然很少

SPOTLIGHT on: Building envelope

- A good building envelope is the basis for high energy efficiency for heating and cooling and a low installed capacity of heating and cooling
- Without a well-insulated, airtight building envelope with good summer thermal protection (fixed shading, mobile blinds, etc.), the Minergie rating cannot be achieved
- With a good envelope, costs can be optimized over the life cycle, as the building services and thus the operating costs can be minimized

亮点：建筑围护结构

- 良好的建筑围护结构是高效供暖和制冷以及采用低装机容量暖通设备的基础
- 如果没有隔热良好、气密优良的建筑围护结构和良好的夏季热保护（固定遮阳、移动百叶窗等），就无法获得 Minergie 认证
- 良好的围护结构和高效的建筑设备，可以在整个生命周期内优化成本，同时可以最大限度地降低运营成本



Procedure for Minergie certification

Minergie 认证程序



Cost range for certifications according to Minergie-A 基于Minergie-A认证的成本范围 (per building, approx. in US\$) (每栋, 以美元估算)

< 2'000 m ²	8'000
2'001 – 5'000 m ²	10'500
5'001 - 10'000 m ²	17'500
10'001 - 20'000 m ²	27'500
> 20'000 m ²	Max. 50'000

60% of the invoice amount is due before the 1st audit step, 40% before the 2nd audit

发票金额的 60% 在第一次审计步骤之前支付, 40% 在第二次审计之前支付

Certification process

- Minergie knows a two-stage certification process:
 - 1. audit of the planning documents with subsequent improvements,
 - 2. audit: acceptance of the project incl. on-site inspection and review of the commissioning protocols.
- Currently Chinese projects are checked and certified in Switzerland, in English or German
- The fees are determined on a project-specific basis. On the basis of a project description, the Minergie association prepares a proposal.

认证流程

- Minergie认证过程分为两个阶段:
 - 1.审核规划文件及后续改进
 - 2.审核: 项目验收, 包括现场检查和调试协议的审查
- 目前, 中国项目将以英语或德语进行审核和认证
- 费用是根据具体项目确定的, 根据项目描述, Minergie协会将提供报价

2022.2

MINERGIE-Nachweisformular 2022.2, zu verwenden bis 31. Dezember 2022

MINERGIE®		EN-101b	Energienachweis Energiebedarf			
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E7	Projektname:		Parz.-Nr.:		MOP - Nr.:	
E8	Gebäudeadresse:					

E13	Gebäudedaten		Gebäudestandort:		m.ü.M.	Kanton:	
E14	(aus SIA 380/1)		Art des Nachweises:	Minergie mit SIA 380/1:2016		Klimastation:	
	Zone			1	2	3	4
							Summe
E16	Gebäudekategorie						(Mittel)
E17	Mit Warmwasser ?						
E19	Energiebezugsfläche EBF	A _E	m ²				
E21	Neubau						
E23	Gebäudehüllzahl	A _v /A _E					
E24	Heizwärmebedarf mit Standardluftwechsel	Q _h	kWh/m ²				

E27	Lüftung-Klima-Kälteanlagen						
Der thermisch wirksame Aussenluft-Volumenstrom ist in der Heizwärmebedarfsberechnung (SIA 380/1) entsprechend F45 - I45 einzusetzen							
	Angaben bei Standard-Lüftungsanlagen	Zone		1	2	3	4
							Summe
E30	Kleinanlagen mit Standardwerten						
E31	Standard-Lüftungsanlagentyp						
E32							
E34	Wärmerückgewinnungs-Wärmetauscher						
E35	Ventilatorantrieb mit						
E37	Nenn-Luftvolumenstrom		m ³ /h				

Deliveries

- Floor plans on a scale of 1:100
- Information on the individual usage zones and their areas
- Documents on the air-tightness concept and the wall constructions (thermal insulation), including information on the size and quality of the windows
- Schematics of the building services trades as heating, cooling, hot water, photovoltaics etc.
- Energy calculations for heating, cooling and hot water consumption (calculation of the Minergie index)

交付材料

- 比例为 1： 100 的平面图
- 有关各个使用区域的信息
- 有关气密性方案和墙体结构（隔热）的文件， 包括有关窗户尺寸和质量的信息
- 建筑设备的示意图， 包括供暖、制冷、热水、光伏等
- 供暖、制冷和热水消耗的能耗计算（Minergie指标的计算）

Comparison with other labels
与其他标准的比较

Minergie与中国其他主流标签的粗略比较

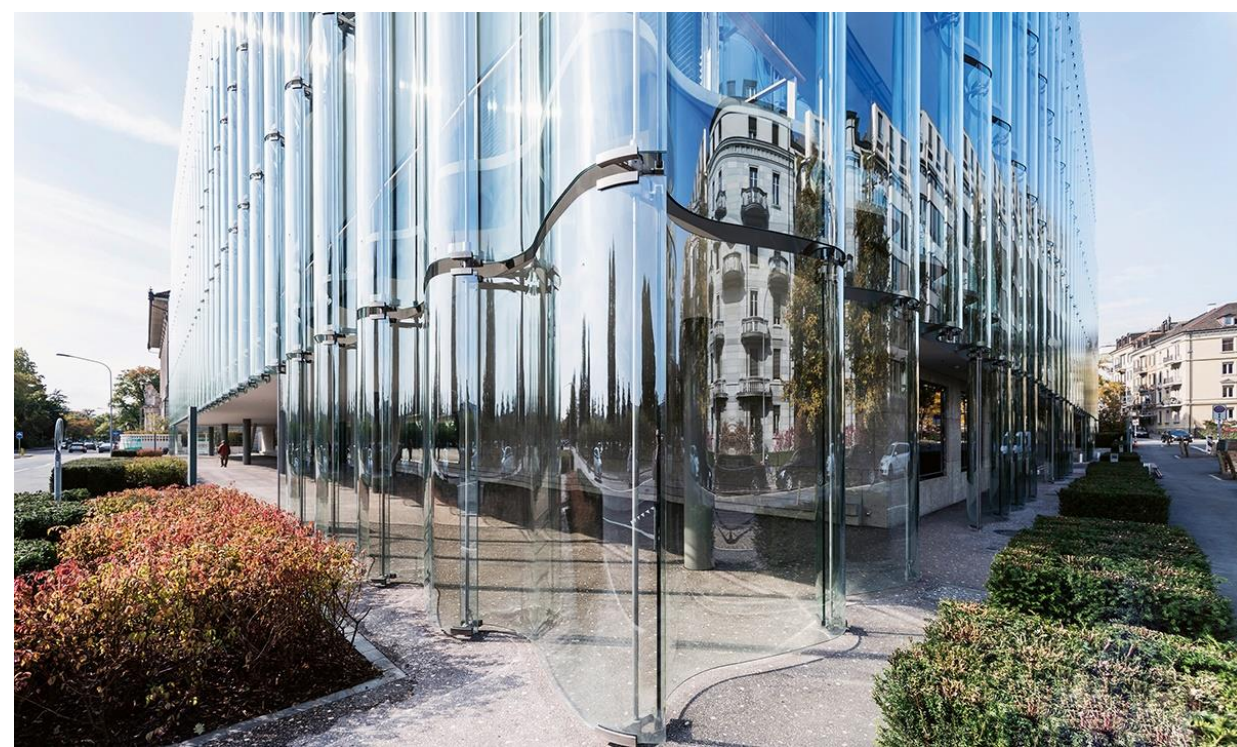
Criteria标准	Minergie-A	Passivhouse被动房	LEED
Coverage of sustainability aspects 涵盖的可持续性方面	Mainly covers environmental aspects and comfort: energy efficiency in operation, photovoltaics, emissions in construction 主要涵盖环境方面和舒适度：运行中的能源效率，光伏，建设过程中的排放	Operational requirements (energy, comfort) similar to Minergie-P, without requirement for photovoltaics and emissions in construction 操作要求（能源、舒适度）与Minergie-P相似，无需光伏和建设过程中的排放	Covers several additional aspects, for example mobility, materials and water 涵盖其他几个方面，例如交通、材料和水
Climate protection effect (operation and creation) 气候保护效果（运营和创新）	Very effective in operation and creation 在运营和创新方面非常有效	Very effective in operation 运营中非常有效	Not as effective as Minergie and Passivhouse in many cases 在许多情况下不如Minergie和Passivhouse有效
Flexibility in technical solutions and materialisation 技术解决方案和实现的灵活性	Flexibility high 高灵活度	Limited i.e. only Passivhouse certified components must be used 受限，即只能使用被动房认证的组件	Generally large, partly individual requirements to be met 较高，需要满足部分个性化需求
Normative basics 规范性基础	Swiss standards 瑞士标准	PHPP (international) PHPP（国际）	US standards 美国标准
Effort (documentation and fees) 工作量（文件和费用）	Comparatively low due to prioritization on a few topics 由于优先考虑几个特定主题，相比其他标签较低	Similar to Minergie, less often officially certified 与Minergie类似，较少获得官方认证	High effort 工作量较大

Examples
案例



Basel Art Museum, Christ Gantenbein, BS-055-P-ECO
巴塞尔艺术博物馆, Christ Gantenbein, BS-055-P-ECO

→ Solid construction
→ 稳固的结构



Swiss Re Headquarters, Diener & Diener, ZH-126-P-
Swiss Re 总部, Diener & Diener, ZH-126-P-ECO

ECO
→ 高科技, 全玻璃
→ High Tech, fully glazed



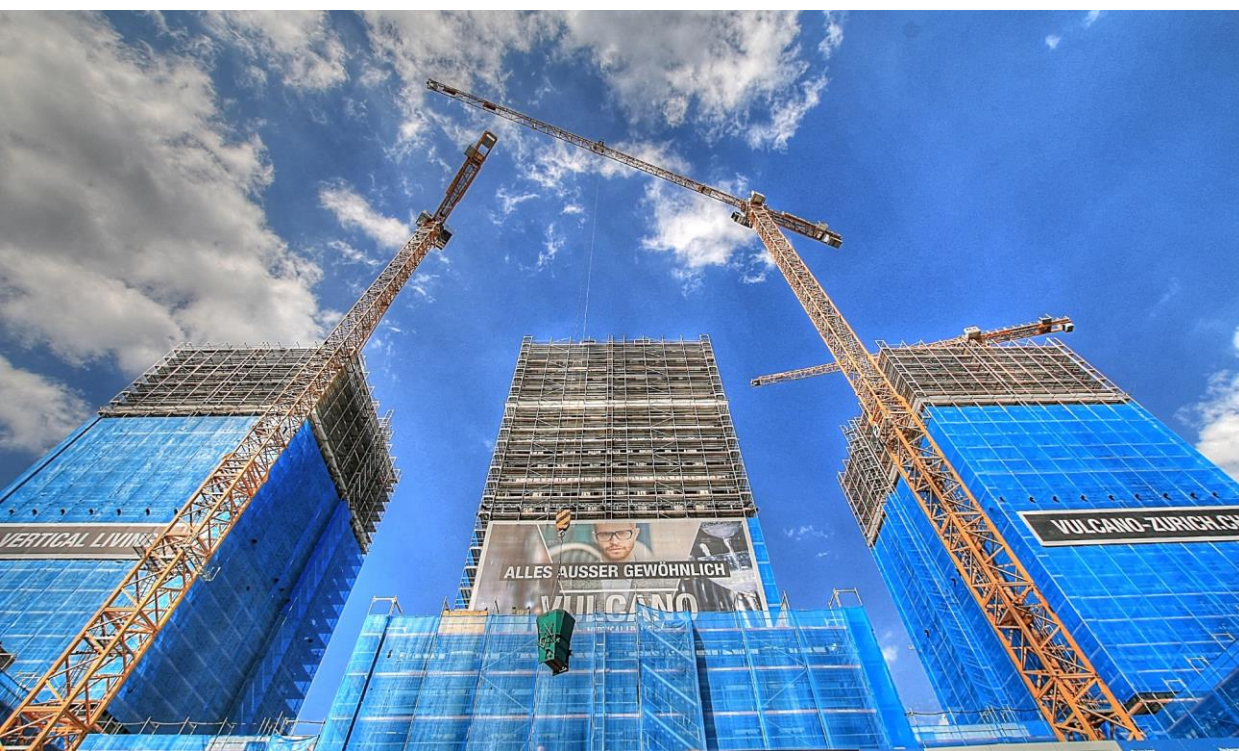
Swiss Federal Institute of Technology Lausanne, Richter Dahl
瑞士洛桑联邦理工学院, Richter Dahl Rocha

Rocha
→ 高科技
→ High Tech

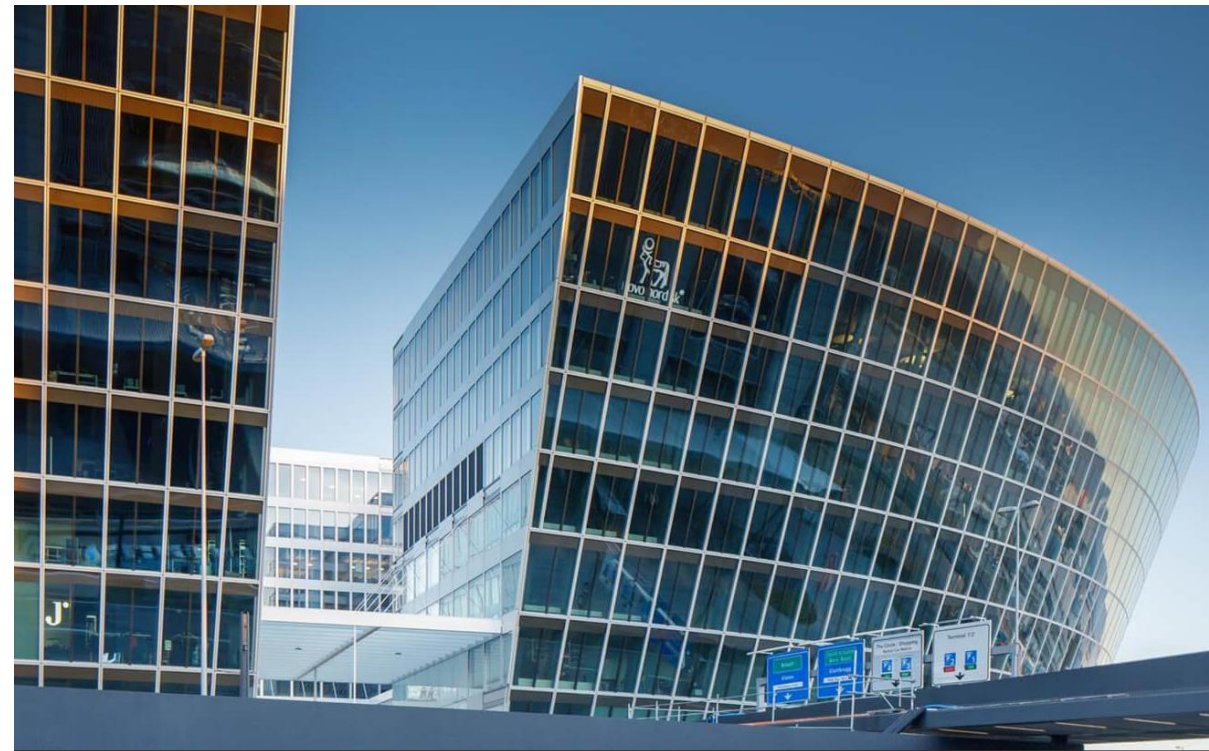


Naturmuseum St. Gallen
圣加仑自然博物馆

→ Low Tech
→ 低技术



Vulcano, D. Perrault Arch., ZH-247-P-ECO
 火山酒店, D. Perrault Arch., ZH-247-P-ECO
 → Hotels
 → 酒店



Zurich Airport, The Circle, ZH-9005
 苏黎世机场, The Circle, ZH-9005
 → The biggest building in Switzerland
 → 瑞士最大的建筑



Emergency Centre Locarno, TI-100-A
卢加诺急救中心, TI-100-A
→ Administration
→ 行政楼



Frey Industrial Park, Azmoos, SG-053-A
Frey 工业园, Azmoos, SG-053-A
→ Administration and industry
→ 行政 & 工业



Shen Neng Environmental Nanshan Ecological Park Cultural and
Sports Centre (vision: Minergie-A)
深能环保南山生态园文体中心(目标认证标准: Minergie-A)
→ High cooling demand covered by photovoltaics
→ 光伏覆盖较高的制冷需求



Zero carbon building Fangshan, Beijing (vision: Minergie-A)
北京房山老人公寓和多功能活动中心(目标认证标准: Minergie-A)
→ Innovation in energy and comfort
→ 能源与舒适度的创新

Conclusions

总结



Minergie-A is an attractive building standard for Chinese investors because:

- simpler and cheaper than labels like LEED
- more liberal but just as effective as Passive House
- applicable for all climate types
- proven certification process with clear specifications, Swiss quality
- an economical and technically optimized method for achieving net zero CO₂ emissions as quickly and efficiently as possible

Minergie-A对中国投资者来说是一个更有吸引力的建筑标准，因为：

- 比LEED等认证更简单、更便宜
- 更自由，但与被动房一样有效
- 适用于所有气候类型
- 经过验证的认证流程，有明确的规范，瑞士质量
- 一种经济且技术上优化的方法，以尽可能快速有效地实现二氧化碳净零排放

感谢您的关注

THANKS FOR YOUR ATTENTION